

ABSTRACT

Magnetic field structures are provided that are composed of stacked magnetic laminae that are magnetically oriented perpendicular to their planes and configured so that a volume charge density is provided and the field effects of unwanted surface negative charges are cancelled. This is accomplished by arranging stacked thin magnetic laminae into various configurations where each of the magnetic laminae is thinner than the radius of that particular layer and the magnetic strength of each layer varies linearly with the normal distance from the center of the magnetic stack. This arrangement causes a uniform volume magnetic charge density, which results in a magnetic field normal to the laminae of the magnitude. One important advantage of this invention's stacked magnetic laminae magnetic field structures is to cancel the field effects of the deleterious unwanted surface charges because these surface charges are so situated that their contributions to the internal magnetic field mutually cancel each other, and thus they are no longer detrimental to the magnetic field created by the volume charge density. Additionally, working spaces to use the internal magnetic field can be made with radial tunnels, meridional slots and so forth.

One embodiment provides a planar magnetic field gradient source structure. Other embodiments include cylindrical and spherical structures, as well as methods for generating magnetic field gradient sources based on a layered magnetic structure composed of magnetic laminae that are magnetically oriented perpendicular to their planes.